

but with the certainty that many had escaped notice. Their character was in general fleecy and small. Five of them were observed to pass over the square of *Pegasus* parallel to the diagonal joining α *Andromeda* to α *Pegasi*. The sky then became too cloudy to continue counting.

Between $6^h 34^m$ and $6^h 39^m$ G.M.T., when the sky had partially cleared, 102 were counted towards the eastern side and 149 on the western. The sky was then scrutinised through the 4-inch telescope in the neighbourhood of the presumed radiant. Not a single short meteor or evanescent star-like outburst was seen, though the sky was then at its clearest. Comparing the result with my recollection of the November meteors in 1866, the total absence of the expected phenomenon is worthy of notice.

Between $7^h 14^m$ and $7^h 19^m$ there were counted 104 on the eastern sky and 201 on the western. No meteors were seen apparently brighter than *Sirius*. Six bright meteors, of approximately the brightness of stars of the 1st magnitude, observed by Mr. Plummer between $6^h 53^m$ and $8^h 15^m$, gave the radiant near ω *Andromedæ* (R.A. 21° , N.P.D. 45°), which agreed with the general impression derived from the other meteors. Mr. Jenkins, from his observations, regarded the radiant as a little more easterly, viz. about R.A. 23° , and N.P.D. 46° . No further available observations were possible during the remainder of the night, owing to the general prevalence of clouds and rain.

University Observatory, Oxford:
1885, Dec. 10.

On the Meteoric Shower of November 27, 1885.
By Ralph Copeland, Ph.D.

On the night of November 27, 1878, Lord Lindsay (now Lord Crawford) and the writer watched at Dun Echt for the greater part of eight hours for any possible return of the Biela meteors of 1872. As far as the meteors in question were concerned, the immediate result was almost altogether negative, for scarcely a single shooting-star was seen which could be referred to a radiant in *Andromeda*. The conclusion, however, was obvious, that the meteors were not, by any means, distributed round the whole orbit of the lost comet. But by taking the comet's period at 6 years and 202 days, as given in the appendix to Herschel's *Outlines of Astronomy*, 11th edition, it became evident that in 1885, November 27, would fall only 40 days short of two periods elapsed since the grand display in 1872, and would afford the best chance that could occur during the remainder of

this century. This conclusion was communicated to the Royal Astronomical Society, along with a *résumé* of the above-mentioned observations.*

From the 22nd until the 26th inst. the nights at Dun Echt were unusually cloudy, so that no telescopic or other examination of the neighbourhood of the meteoric radiant was at all possible. At nightfall on the 27th a dense vault of clouds covered the whole heavens, excepting only an occasional clear streak on the horizon. It was at 5.45 G.M.T. that numerous bright meteors were first seen descending across this streak. But the clouds soon lifted and thinned rapidly, so that from 6^h 13^m to 6^h 21^m I was able to count 109 meteors which could be referred to a common source in the direction of *Andromeda*. They were all of one clearly-marked type, moving somewhat slowly, with well-defined heads, and of all degrees of brightness, from the 2nd magnitude down to the faintest streaks that the eye could distinguish. Occasionally one of fully the 1st magnitude would leave a train that lasted for four or five seconds. The meteors came, now singly, now in pairs, and not infrequently in bursts of five or six at a time.

By holding a direct-vision prism with the refracting angle in the direction of the paths of the meteors, and watching a part of the sky in which they were most numerous, it was not difficult to catch an occasional sight of their spectra. Of seven spectra seen in this way, all were of the same kind, consisting of a somewhat faint continuous spectrum, with one relatively very bright line. The position of this line was not determined, but it is probably not far from F. Indeed, the whole spectrum was rather like that of a bright planetary nebula superposed on a faint continuous spectrum.

Nineteen well-situated paths, noted between 7^h 17^m and 8^h 3^m, gave a very definite radiant point in R.A. 25°·9 and N. Decl. 46°·4. An examination of this point and its surroundings with a very low power on a 6-inch telescope revealed nothing, while some little time was lost in the identification of the remarkable double nebula.—*Gen. Cat.*, Nos. 385–6.

In the mean time 700 meteors were counted towards the east, from 7^h 10^m to 7^h 30^m G.M.T.; while a member of my family numbered almost exactly 2,000 in the S.W. between 6^h 30^m and 7^h 30^m, although in both cases the sky was often at least half clouded over. In half an hour, beginning at eight o'clock, favoured by a nearly clear sky, the last observer noted 864 meteors, again to the S.W. Shortly after nine o'clock, even while making every allowance for increasing cloud, it became most evident that the display was fast diminishing. About 10^h 40^m the canopy of cloud lifted a little towards the east for about ten minutes, but not a single meteor was seen to cross the

* See *Monthly Notices*, vol. xxxix., p. 520.

clear belt thus formed. Immediately afterwards heavy rain-clouds settled hopelessly down and concealed the sky for the rest of the night.

Dun Echt Observatory:
1885, Nov. 30.

*The Great Shower of Andromedes, November 26, 27, 28,
and 30, 1885. By W. F. Denning.*

The nights of November 24 and 25 were overcast here.

On the evening of November 26 heavy rain fell before 8^h 30^m, then the atmosphere cleared somewhat, and I counted 21 shooting stars in the ensuing 15 minutes. Of these, 19 were *Andromedes*. The sky then clouded again, but later on, through temporary breaks, I saw 42 additional meteors, including 41 *Andromedes*. I estimated that with a clear sky the hourly number visible for one observer was about 130. The radiant point was at $26^{\circ} + 44^{\circ}$, but the observed tracks did not come precisely to a focus. It was necessary to adopt a radiant area of several degrees diameter in order to satisfy the directions. No observations were possible after 12^h 30^m on November 26; clouds and occasional storms interfered until daylight.

On November 27 the sky in the early evening was much involved in clouds and haze, but before the twilight had disappeared, and before any stars could be distinguished, I observed several fine *Andromedes* with their typical spark-trains and very slow motions. It was at once evident that since the preceding night the display had developed into one of great richness. As the sky grew darker the number of meteors rapidly increased, but the heavens continued to be so much involved in cloud that the real strength of the shower could not be adequately determined. I counted the meteors in intervals of five minutes as follow:—

		No. seen.	State of sky.
h m	h m		
5 10 to 5 15		33	Very cloudy and hazy. Only <i>Capella</i> and two or three other bright stars visible.
5 25	5 30	126	Sky very much overcast.
5 55	6 0	105	Sky more overcast, very few stars visible.
6 25	6 30	222	Clearer, but still hazy and the stars looking dim.

No regular observations could be obtained after 6^h 40^m owing to clouds and rain, which continued almost unabated